

# SEQUENCE LISTING

<110> Caimi, Perry G.

<120> Utilization of Starch Products for Biological Production by Fermentation

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<151> 08-23-2002

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 <212> PRT  
 <213> Streptococcus mutans ATCC#25175D

<400> 17

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 35 40 45

Trp Leu Ser Pro Val Tyr Asp Ser Pro Met Asp Asp Asn Gly Tyr Asp  
 50 55 60

Ile Ala Asn Tyr Glu Ala Ile Ala Asp Ile Phe Gly Asn Met Ala Asp  
 Page 13

65					70					75					80				
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Glu	Ala	Arg <sub>115</sub>	Glu	His	Pro	Asp	Ser <sub>120</sub>	Ser	Glu	Arg	Asp	Tyr <sub>125</sub>	Tyr	Ile	Trp				
Cys	Asp <sub>130</sub>	Gln	Pro	Asn	Asp	Leu <sub>135</sub>	Glu	Ser	Ile	Phe	Gly <sub>140</sub>	Gly	Ser	Ala	Trp				
Gln	Tyr	Asp	Asp	Lys	Ser <sub>150</sub>	Asp	Gln	Tyr	Tyr	Leu <sub>155</sub>	His	Phe	Phe	Ser	Lys <sub>160</sub>				
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Ser	Phe	Gly	Gln	His	Asp <sub>230</sub>	Leu	Leu	Thr	Val	Gly <sub>235</sub>	Glu	Thr	Trp	Gly	Ala <sub>240</sub>				
Thr	Pro	Glu	Ile	Ala <sub>245</sub>	Lys	Gln	Tyr	Ser	Asn <sub>250</sub>	Pro	Val	Asn	His	Glu <sub>255</sub>	Leu				
Ser	Met	Ile	Phe <sub>260</sub>	Gln	Phe	Glu	His	Ile <sub>265</sub>	Gly	Leu	Gln	His	Lys <sub>270</sub>	Pro	Glu				
Ala	Pro	Lys <sub>275</sub>	Trp	Asp	Tyr	Val	Lys <sub>280</sub>	Glu	Leu	Asn	Val	Pro <sub>285</sub>	Ala	Leu	Lys				
Thr	Ile <sub>290</sub>	Phe	Asn	Lys	Trp	Gln <sub>295</sub>	Thr	Glu	Leu	Glu	Leu <sub>300</sub>	Gly	Gln	Gly	Trp				
Asn	Ser	Leu	Phe	Trp	Asn <sub>310</sub>	Asn	His	Asp	Leu	Pro <sub>315</sub>	Arg	Val	Leu	Ser	Ile <sub>320</sub>				
Trp	Gly	Asn	Thr	Gly <sub>325</sub>	Lys	Tyr	Arg	Glu	Lys <sub>330</sub>	Ser	Ala	Lys	Ala	Leu <sub>335</sub>	Ala				
Ile	Leu	Leu	His <sub>340</sub>	Leu	Met	Arg	Gly	Thr <sub>345</sub>	Pro	Tyr	Ile	Tyr	Gln <sub>350</sub>	Gly	Glu				

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           370                                  375                                  380  
 Ser Met Glu Thr Ile Met Asp Ser Ile Arg Met Ile Gly Arg Asp Asn  
   385                                  390                                  395                                  400  
 Ala Arg Thr Pro Met Gln Trp Asp Ala Ser Gln Asn Ala Gly Phe Ser  
                                   405                                  410                                  415  
 Thr Ala Asp Lys Thr Trp Leu Pro Val Asn Pro Asn Tyr Lys Asp Ile  
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 Asn Val Gln Ala Ala Leu Lys Asn Ser Asn Ser Ile Phe Tyr Thr Tyr  
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           450                                  455                                  460  
 Asp Phe Glu Leu Leu Pro Thr Ala Asp Lys Val Phe Ala Tyr Leu Arg  
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 Lys Val Arg Glu Glu Arg Tyr Leu Ile Val Val Asn Val Ser Asp Gln  
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 Glu Glu Val Leu Glu Ile Asp Val Asp Lys Gln Glu Thr Leu Ile Ser  
                                   500                                  505                                  510  
 Asn Thr Asn Glu Ser Ala Ala Leu Ala Asn His Lys Leu Gln Pro Trp  
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 Asp Ala Phe Cys Ile Lys Ile Asn  
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35

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 <211> 93  
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Ala Ile Arg

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<211> 14

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<211> 62

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<220>

<223> Bifidobacterium breve signal

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<211> 42

<212> DNA

<213> Artificial Sequence

<220>

<223> NPR Signal

<400> 27

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<210> 28

<211> 1877

<212> DNA

<213> Bifidobacterium breve

<400> 28

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agaaaatgga ctacctgaaa aacctcggcg tggacgccat ctggctctcc ccgttctacc 240

cctccgatct ggcggacggc ggctacgacg tgatcgacta ccgcaacgtc gaccgcgcac 300

tgggcaccat ggacgacttc gacgccatgg ccaaagccgc gcatgaggcc ggcatcaagg 360

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 <211> 624  
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<400> 29

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Gln Ala Val Val Tyr Gln Ile Tyr Pro Arg Ser Phe Lys Asp Val Asn  
 35 40 45

Gly Asp Gly Ile Gly Asp Ile Ala Gly Val Thr Glu Lys Met Asp Tyr  
 50 55 60

Leu Lys Asn Leu Gly Val Asp Ala Ile Trp Leu Ser Pro Phe Tyr Pro  
 65 70 75 80

Ser Asp Leu Ala Asp Gly Gly Tyr Asp Val Ile Asp Tyr Arg Asn Val  
 85 90 95

Asp Pro Arg Leu Gly Thr Met Asp Asp Phe Asp Ala Met Ala Lys Ala  
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Ala His Glu Ala Gly Ile Lys Val Ile Val Asp Ile Val Pro Asn His  
 115 120 125

Thr Ala Asp Lys His Val Phe Phe Lys Glu Ala Leu Ala Ala Glu Pro  
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Gly Ser Pro Ala Arg Asp Arg Tyr Ile Phe Arg Asp Gly Arg Gly Glu  
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His Gly Glu Leu Pro Pro Asn Asp Trp Gln Ser Phe Phe Gly Gly Pro  
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Ala Trp Ala Arg Val Ala Asp Gly Gln Trp Tyr Leu His Leu Phe Asp  
 180 185 190

Lys Ala Gln Pro Asp Val Asn Trp Lys Asn Pro Asp Ile His Glu Glu  
 195 200 205

Phe Lys Lys Thr Leu Arg Phe Trp Ser Asp His Gly Thr Asp Gly Phe  
 210 215 220

Arg Ile Asp Val Ala His Gly Leu Ala Lys Asp Leu Glu Ser Lys Pro  
 225 230 235 240

Leu Glu Glu Leu Gly Arg Glu Tyr Ser Val Val Gly Val Leu Asn His  
 245 250 255

Asp Phe Ser His Pro Leu Phe Asp Arg Arg Glu Val His Asp Ile Tyr  
 260 265 270

Arg Glu Trp Arg Lys Val Phe Asn Glu Tyr Asp Pro Pro Arg Phe Ala  
 275 280 285

Val Ala Glu Ala Trp Val Val Pro Glu His Gln His Leu Tyr Ala Ser  
 290 295 300

Met Asp Glu Leu Gly Gln Ser Phe Asn Phe Asp Phe Ala Gln Ala Ser  
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Trp Tyr Ala Asp Glu Phe Arg Ala Ala Ile Ala Ala Gly Leu Lys Ala  
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 Ala Ala Glu Thr Gly Gly Ser Thr Thr Thr Trp Val Met Asn Asn His  
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 Asp Val Pro Arg Ser Pro Ser Arg Tyr Gly Leu Pro Gln Val Lys Gly  
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 Ala Pro Tyr His Gln Leu Pro His Asp Trp Leu Leu Arg Asn Gly Thr  
 370 375 380  
 Thr Tyr Pro Glu Asp Arg Glu Leu Gly Thr Arg Arg Ala Arg Ala Ala  
 385 390 395 400  
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 405 410 415  
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 Glu Asp Pro Thr Ala Phe His Thr Ala Gln Ala Thr Met Asp Lys Gly  
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 Arg Asp Gly Cys Arg Val Pro Ile Pro Trp Thr Ala Ala Asn Glu Pro  
 450 455 460  
 Thr Leu Ala Asp Phe Ser Arg Pro Ile Pro Ala Asp Asp Gly Thr Gly  
 465 470 475 480  
 Glu Asn His Val Pro Leu Cys Ala Ala Gly Gln Phe Gly Thr Gly Ala  
 485 490 495  
 Ser Phe Gly Phe Ser Pro Ala Thr Arg Ala Glu Gly Val Thr Pro Ala  
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 Ala Asp Pro His Leu Pro Gln Pro Leu Trp Phe Lys Asp Tyr Ala Val  
 515 520 525  
 Asp Val Glu Gln Ala Asp Pro Asp Ser Met Leu Ala Leu Tyr His Ala  
 530 535 540  
 Ala Leu Ala Ile Arg Gln Glu Ser Leu Thr Ala Thr Arg Asp Thr Thr  
 545 550 555 560  
 Ala Glu Gln Val Asp Met Gly Pro Asp Val Val Ala Tyr Thr Arg Ala  
 565 570 575  
 Ala Val Gly Gly Arg Thr Phe Thr Ser Ile Thr Asn Phe Gly Thr Glu  
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Pro Val Glu Leu Pro Gly Gly Ser Val Val Leu Thr Ser Gly Pro Leu  
595 600 605

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<212> DNA  
<213> Bifidobacterium breve

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gagattgatg ttgacaaaca agaaactctc attagcaata caaatgaaag cgctgctctt 1560  
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<210> 31  
<211> 536  
<212> PRT  
<213> Bifidobacterium breve

<400> 31

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35 40 45

Trp Leu Ser Pro Val Tyr Asp Ser Pro Met Asp Asp Asn Gly Tyr Asp  
50 55 60

Ile Ala Asn Tyr Glu Ala Ile Ala Asp Ile Phe Gly Asn Met Ala Asp  
65 70 75 80

Met Asp Asn Leu Leu Thr Gln Ala Lys Met Arg Asp Ile Lys Ile Ile  
85 90 95

Met Asp Leu Val Val Asn His Thr Ser Asp Glu His Thr Trp Phe Ile  
100 105 110

Glu Ala Arg Glu His Pro Asp Ser Ser Glu Arg Asp Tyr Tyr Ile Trp  
115 120 125

Cys Asp Gln Pro Asn Asp Leu Glu Ser Ile Phe Gly Gly Ser Ala Trp  
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Gln Tyr Asp Asp Lys Ser Asp Gln Tyr Tyr Leu His Phe Phe Ser Lys  
145 150 155 160

Lys Gln Pro Asp Leu Asn Trp Glu Asn Ala Asn Leu Arg Gln Lys Ile  
165 170 175

Tyr Asp Met Met Asn Phe Trp Ile Asp Lys Gly Ile Gly Gly Phe Arg  
180 185 190

Met Asp Val Ile Asp Met Ile Gly Lys Ile Pro Ala Gln His Ile Val  
195 200 205

Ser Asn Gly Pro Lys Leu His Ala Tyr Leu Lys Glu Met Asn Ala Ala  
210 215 220

Ser Phe Gly Gln His Asp Leu Leu Thr Val Gly Glu Thr Trp Gly Ala  
225 230 235 240

Thr Pro Glu Ile Ala Lys Gln Tyr Ser Asn Pro Val Asn His Glu Leu  
245 250 255

Ser Met Ile Phe Gln Phe Glu His Ile Gly Leu Gln His Lys Pro Glu  
 260 265 270  
 Ala Pro Lys Trp Asp Tyr Val Lys Glu Leu Asn Val Pro Ala Leu Lys  
 275 280 285  
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 Asn Ser Leu Phe Trp Asn Asn His Asp Leu Pro Arg Val Leu Ser Ile  
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 325 330 335  
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 340 345 350  
 Glu Ile Gly Met Thr Asn Tyr Pro Phe Lys Asp Leu Asn Glu Leu Asp  
 355 360 365  
 Asp Ile Glu Ser Leu Asn Tyr Ala Lys Glu Ala Phe Thr Asn Gly Lys  
 370 375 380  
 Ser Met Glu Thr Ile Met Asp Ser Ile Arg Met Ile Gly Arg Asp Asn  
 385 390 395 400  
 Ala Arg Thr Pro Met Gln Trp Asp Ala Ser Gln Asn Ala Gly Phe Ser  
 405 410 415  
 Thr Ala Asp Lys Thr Trp Leu Pro Val Asn Pro Asn Tyr Lys Asp Ile  
 420 425 430  
 Asn Val Gln Ala Ala Leu Lys Asn Ser Asn Ser Ile Phe Tyr Thr Tyr  
 435 440 445  
 Gln Gln Leu Ile Gln Leu Arg Lys Glu Asn Asp Trp Leu Val Asp Ala  
 450 455 460  
 Asp Phe Glu Leu Leu Pro Thr Ala Asp Lys Val Phe Ala Tyr Leu Arg  
 465 470 475 480  
 Lys Val Arg Glu Glu Arg Tyr Leu Ile Val Val Asn Val Ser Asp Gln  
 485 490 495  
 Glu Glu Val Leu Glu Ile Asp Val Asp Lys Gln Glu Thr Leu Ile Ser  
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 Asn Thr Asn Glu Ser Ala Ala Leu Ala Asn His Lys Leu Gln Pro Trp  
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<211> 1880  
<212> DNA  
<213> Bifidobacterium breve

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Val Val Tyr Gln Ile Tyr Pro Arg Ser Phe Gln Asp Thr Asn Gly Asp  
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Gly Phe Gly Asp Leu Lys Gly Ile Thr Ser Arg Leu Asp Tyr Leu Ala  
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Asp Leu Gly Val Asp Val Leu Trp Leu Ser Pro Val Tyr Arg Ser Pro  
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Gln Asp Asp Asn Gly Tyr Asp Ile Ser Asp Tyr Arg Asp Ile Asp Pro  
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Leu Phe Gly Thr Leu Asp Asp Met Asp Glu Leu Leu Ala Glu Ala His  
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Lys Arg Gly Leu Lys Ile Val Met Asp Leu Val Val Asn His Thr Ser  
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Asp Glu His Ala Trp Phe Glu Ala Ser Lys Asp Lys Asp Asp Pro His  
145 150 155 160

Ala Asp Trp Tyr Trp Trp Arg Pro Ala Arg Pro Gly His Glu Pro Gly  
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Thr Pro Gly Ala Glu Pro Asn Gln Trp Gly Ser Tyr Phe Gly Gly Ser  
180 185 190

Ala Trp Glu Tyr Cys Pro Glu Arg Gly Glu Tyr Tyr Leu His Gln Phe  
195 200 205

Ser Lys Lys Gln Pro Asp Leu Asn Trp Glu Asn Pro Ala Val Arg Arg  
210 215 220

Ala Val Tyr Asp Met Met Asn Trp Trp Leu Asp Arg Gly Ile Asp Gly  
 225 230 235 240  
 Phe Arg Met Asp Val Ile Thr Leu Ile Ser Lys Arg Thr Asp Ala Asn  
 245 250 255  
 Gly Arg Leu Pro Gly Glu Thr Gly Ser Glu Leu Gln Asp Leu Pro Val  
 260 265 270  
 Gly Glu Glu Gly Tyr Ser Asn Pro Asn Pro Phe Cys Ala Asp Gly Pro  
 275 280 285  
 Arg Gln Asp Glu Phe Leu Ala Glu Met Arg Arg Glu Val Phe Asp Gly  
 290 295 300  
 Arg Asp Gly Phe Leu Thr Val Gly Glu Ala Pro Gly Ile Thr Ala Glu  
 305 310 315 320  
 Arg Asn Glu His Ile Thr Asp Pro Ala Asn Gly Glu Leu Asp Met Leu  
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 Phe Leu Phe Glu His Met Gly Val Asp Gln Thr Pro Glu Ser Lys Trp  
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 Asp Asp Lys Pro Trp Thr Pro Ala Asp Leu Glu Thr Lys Leu Ala Glu  
 355 360 365  
 Gln Gln Asp Ala Ile Ala Arg His Gly Trp Ala Ser Leu Phe Leu Asp  
 370 375 380  
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 Ile Asn Ala Tyr His Gln Arg Val Glu Glu Thr Gly Ile Arg Thr Ser  
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 Glu Thr Met Met Arg Ser Leu Ala Arg Tyr Gly Arg Asp Asn Ala Arg  
 465 470 475 480  
 Thr Pro Met Gln Trp Asp Asp Ser Thr Tyr Ala Gly Phe Thr Met Pro  
 485 490 495

Asp Ala Pro Val Glu Pro Trp Ile Ala Val Asn Pro Asn His Thr Glu  
500 505 510

Ile Asn Ala Ala Asp Glu Ile Asp Asp Pro Asp Ser Val Tyr Ser Phe  
515 520 525

His Lys Arg Leu Ile Ala Leu Arg His Thr Asp Pro Val Val Ala Ala  
530 535 540

Gly Asp Tyr Arg Arg Val Glu Thr Gly Asn Asp Arg Ile Ile Ala Phe  
545 550 555 560

Thr Arg Thr Leu Asp Glu Arg Thr Ile Leu Thr Val Ile Asn Leu Ser  
565 570 575

Pro Thr Gln Ala Ala Pro Ala Gly Glu Leu Glu Thr Met Pro Asp Gly  
580 585 590

Thr Ile Leu Ile Ala Asn Thr Asp Asp Pro Val Gly Asn Leu Lys Thr  
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Glu  
625

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<212> DNA  
<213> Bifidobacterium breve + Streptococcus mutans

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tggttaatca tacctcagat gaacatactt ggtttattga agcacgtgag catccagaca 420  
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<210> 35  
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 <213> Bifidobacterium breve + Streptococcus mutans

<400> 35

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35 40 45

Asp Leu Lys Gly Ile Thr Ser Lys Leu Asp Tyr Leu Gln Lys Leu Gly  
50 55 60

Val Met Ala Ile Trp Leu Ser Pro Val Tyr Asp Ser Pro Met Asp Asp  
65 70 75 80

Asn Gly Tyr Asp Ile Ala Asn Tyr Glu Ala Ile Ala Asp Ile Phe Gly  
85 90 95

Asn Met Ala Asp Met Asp Asn Leu Leu Thr Gln Ala Lys Met Arg Asp  
100 105 110

Ile Lys Ile Ile Met Asp Leu Val Val Asn His Thr Ser Asp Glu His  
115 120 125

Thr Trp Phe Ile Glu Ala Arg Glu His Pro Asp Ser Ser Glu Arg Asp  
130 135 140

Tyr Tyr Ile Trp Cys Asp Gln Pro Asn Asp Leu Glu Ser Ile Phe Gly  
145 150 155 160

Gly Ser Ala Trp Gln Tyr Asp Asp Lys Ser Asp Gln Tyr Tyr Leu His  
165 170 175

Phe Phe Ser Lys Lys Gln Pro Asp Leu Asn Trp Glu Asn Ala Asn Leu  
180 185 190

Arg Gln Lys Ile Tyr Asp Met Met Asn Phe Trp Ile Asp Lys Gly Ile  
195 200 205

Gly Gly Phe Arg Met Asp Val Ile Asp Met Ile Gly Lys Ile Pro Ala  
210 215 220

Gln His Ile Val Ser Asn Gly Pro Lys Leu His Ala Tyr Leu Lys Glu  
225 230 235 240

Met Asn Ala Ala Ser Phe Gly Gln His Asp Leu Leu Thr Val Gly Glu  
245 250 255

Thr Trp Gly Ala Thr Pro Glu Ile Ala Lys Gln Tyr Ser Asn Pro Val  
260 265 270

Asn His Glu Leu Ser Met Ile Phe Gln Phe Glu His Ile Gly Leu Gln  
275 280 285

His Lys Pro Glu Ala Pro Lys Trp Asp Tyr Val Lys Glu Leu Asn Val  
290 295 300

Pro Ala Leu Lys Thr Ile Phe Asn Lys Trp Gln Thr Glu Leu Glu Leu  
305 310 315 320

Gly Gln Gly Trp Asn Ser Leu Phe Trp Asn Asn His Asp Leu Pro Arg  
325 330 335

Val Leu Ser Ile Trp Gly Asn Thr Gly Lys Tyr Arg Glu Lys Ser Ala  
340 345 350

Lys Ala Leu Ala Ile Leu Leu His Leu Met Arg Gly Thr Pro Tyr Ile  
355 360 365

Tyr Gln Gly Glu Glu Ile Gly Met Thr Asn Tyr Pro Phe Lys Asp Leu  
370 375 380

Asn Glu Leu Asp Asp Ile Glu Ser Leu Asn Tyr Ala Lys Glu Ala Phe  
385 390 395 400

Thr Asn Gly Lys Ser Met Glu Thr Ile Met Asp Ser Ile Arg Met Ile  
Page 29

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Gly Arg Asp	Asn Ala Arg Thr Pro Met Gln Trp Asp Ala Ser Gln Asn				
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Ala Gly Phe	Ser Thr Ala Asp Lys Thr Trp Leu Pro Val Asn Pro Asn				
	435		440		445
Tyr Lys Asp	Ile Asn Val Gln Ala Ala Leu Lys Asn Ser Asn Ser Ile				
	450		455		460
Phe Tyr Thr Tyr	Gln Gln Leu Ile Gln Leu Arg Lys Glu Asn Asp Trp				
	465		470		475
Leu Val Asp	Ala Asp Phe Glu Leu Leu Pro Thr Ala Asp Lys Val Phe				
	485		490		495
Ala Tyr Leu	Arg Lys Val Arg Glu Glu Arg Tyr Leu Ile Val Val Asn				
	500		505		510
Val Ser Asp	Gln Glu Glu Val Leu Glu Ile Asp Val Asp Lys Gln Glu				
	515		520		525
Thr Leu Ile	Ser Asn Thr Asn Glu Ser Ala Ala Leu Ala Asn His Lys				
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Leu Gln Pro	Trp Asp Ala Phe Cys Ile Lys Ile Asn				
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 <211> 1857  
 <212> DNA  
 <213> Bacillus and Bifidobacterium breve

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 <212> PRT  
 <213> Bacillus and Bifidobacterium breve

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Ile Tyr Pro Arg Ser Phe Lys Asp Val Asn Gly Asp Gly Ile Gly Asp  
35 40 45

Ile Ala Gly Val Thr Glu Lys Met Asp Tyr Leu Lys Asn Leu Gly Val  
50 55 60

Asp Ala Ile Trp Leu Ser Pro Phe Tyr Pro Ser Asp Leu Ala Asp Gly  
65 70 75 80

Gly Tyr Asp Val Ile Asp Tyr Arg Asn Val Asp Pro Arg Leu Gly Thr  
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Met Asp Asp Phe Asp Ala Met Ala Lys Ala Ala His Glu Ala Gly Ile  
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 Lys Val Ile Val Asp Ile Val Pro Asn His Thr Ala Asp Lys His Val  
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 Phe Phe Lys Glu Ala Leu Ala Ala Glu Pro Gly Ser Pro Ala Arg Asp  
 130 135 140  
 Arg Tyr Ile Phe Arg Asp Gly Arg Gly Glu His Gly Glu Leu Pro Pro  
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 Asn Asp Trp Gln Ser Phe Phe Gly Gly Pro Ala Trp Ala Arg Val Ala  
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 Asp Gly Gln Trp Tyr Leu His Leu Phe Asp Lys Ala Gln Pro Asp Val  
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 Asn Trp Lys Asn Pro Asp Ile His Glu Glu Phe Lys Lys Thr Leu Arg  
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 225 230 235 240  
 Glu Tyr Ser Val Val Gly Val Leu Asn His Asp Phe Ser His Pro Leu  
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 Phe Asp Arg Arg Glu Val His Asp Ile Tyr Arg Glu Trp Arg Lys Val  
 260 265 270  
 Phe Asn Glu Tyr Asp Pro Pro Arg Phe Ala Val Ala Glu Ala Trp Val  
 275 280 285  
 Val Pro Glu His Gln His Leu Tyr Ala Ser Met Asp Glu Leu Gly Gln  
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 Ser Phe Asn Phe Asp Phe Ala Gln Ala Ser Trp Tyr Ala Asp Glu Phe  
 305 310 315 320  
 Arg Ala Ala Ile Ala Ala Gly Leu Lys Ala Ala Ala Glu Thr Gly Gly  
 325 330 335  
 Ser Thr Thr Thr Trp Val Met Asn Asn His Asp Val Pro Arg Ser Pro  
 340 345 350  
 Ser Arg Tyr Gly Leu Pro Gln Val Lys Gly Ala Pro Tyr His Gln Leu  
 355 360 365



Pro His Asp Trp Leu Leu Arg Asn Gly Thr Thr Tyr Pro Glu Asp Arg  
370 375 380

Glu Leu Gly Thr Arg Arg Ala Arg Ala Ala Ala Leu Met Glu Leu Gly  
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Leu Pro Gly Ala Ala Tyr Ile Tyr Gln Gly Glu Glu Leu Gly Leu Phe  
405 410 415

Glu Val Ala Asp Ile Pro Trp Asp Arg Leu Glu Asp Pro Thr Ala Phe  
420 425 430

His Thr Ala Gln Ala Thr Met Asp Lys Gly Arg Asp Gly Cys Arg Val  
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Pro Ile Pro Trp Thr Ala Ala Asn Glu Pro Thr Leu Ala Asp Phe Ser  
450 455 460

Arg Pro Ile Pro Ala Asp Asp Gly Thr Gly Glu Asn His Val Pro Leu  
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Cys Ala Ala Gly Gln Phe Gly Thr Gly Ala Ser Phe Gly Phe Ser Pro  
485 490 495

Ala Thr Arg Ala Glu Gly Val Thr Pro Ala Ala Asp Pro His Leu Pro  
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Gln Pro Leu Trp Phe Lys Asp Tyr Ala Val Asp Val Glu Gln Ala Asp  
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Pro Asp Ser Met Leu Ala Leu Tyr His Ala Ala Leu Ala Ile Arg Gln  
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<211> 1653

<212> DNA

<213> Bacillus and Bifidobacterium breve

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<211> 550  
<212> PRT  
<213> Bacillus and Bifidobacterium breve

<400> 39

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 Ser Lys Leu Asp Tyr Leu Gln Lys Leu Gly Val Met Ala Ile Trp Leu  
 50 55 60  
 Ser Pro Val Tyr Asp Ser Pro Met Asp Asp Asn Gly Tyr Asp Ile Ala  
 65 70 75 80  
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 85 90 95  
 Asn Leu Leu Thr Gln Ala Lys Met Arg Asp Ile Lys Ile Ile Met Asp  
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 Leu Val Val Asn His Thr Ser Asp Glu His Thr Trp Phe Ile Glu Ala  
 115 120 125  
 Arg Glu His Pro Asp Ser Ser Glu Arg Asp Tyr Tyr Ile Trp Cys Asp  
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 Gln Pro Asn Asp Leu Glu Ser Ile Phe Gly Gly Ser Ala Trp Gln Tyr  
 145 150 155 160  
 Asp Asp Lys Ser Asp Gln Tyr Tyr Leu His Phe Phe Ser Lys Lys Gln  
 165 170 175  
 Pro Asp Leu Asn Trp Glu Asn Ala Asn Leu Arg Gln Lys Ile Tyr Asp  
 180 185 190  
 Met Met Asn Phe Trp Ile Asp Lys Gly Ile Gly Gly Phe Arg Met Asp  
 195 200 205  
 Val Ile Asp Met Ile Gly Lys Ile Pro Ala Gln His Ile Val Ser Asn  
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 Gly Pro Lys Leu His Ala Tyr Leu Lys Glu Met Asn Ala Ala Ser Phe  
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 Gly Gln His Asp Leu Leu Thr Val Gly Glu Thr Trp Gly Ala Thr Pro  
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 Glu Ile Ala Lys Gln Tyr Ser Asn Pro Val Asn His Glu Leu Ser Met  
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 Ile Phe Gln Phe Glu His Ile Gly Leu Gln His Lys Pro Glu Ala Pro  
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				Thr 310
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				Gly 315
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				Trp
				Asn
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				Asp
				Leu
				Pro
				Arg
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				Ser
				Ile
				Trp 335
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				Glu
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				Ala
				Leu
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				Leu
Leu	His	Leu 355	Met	Arg
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				Gln
				Gly 365
				Glu
				Glu
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Gly	Met 370	Thr	Asn	Tyr
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				Phe 375
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				Asp
				Leu
				Asn
				Glu 380
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				Asp
				Asp
				Ile
Glu 385	Ser	Leu	Asn	Tyr
				Ala 390
				Lys
				Glu
				Ala
				Phe
				Thr 395
				Asn
				Gly
				Lys
				Ser
				Met 400
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				Ser
				Ile
				Arg
				Met
				Ile 410
				Gly
				Arg
				Asp
				Asn
				Ala 415
				Arg
Thr	Pro	Met	Gln 420	Trp
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				Ala
				Ser
				Gln 425
				Asn
				Ala
				Gly
				Phe
				Ser 430
				Thr
				Ala
Asp	Lys	Thr 435	Trp	Leu
				Pro
				Val
				Asn 440
				Pro
				Asn
				Tyr
				Lys
				Asp 445
				Ile
				Asn
				Val
Gln 450	Ala	Ala	Leu	Lys
				Asn
				Ser 455
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				Ser
				Ile
				Phe
				Tyr 460
				Thr
				Tyr
				Gln
				Gln
Leu 465	Ile	Gln	Leu	Arg
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				Glu
				Asn
				Asp
				Trp
				Leu 475
				Val
				Asp
				Ala
				Asp
				Phe 480
Glu	Leu	Leu	Pro	Thr 485
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				Asp
				Lys
				Val
				Phe 490
				Ala
				Tyr
				Leu
				Arg
				Lys 495
				Val
Arg	Glu	Glu	Arg	Tyr
				Leu
				Ile
				Val
				Val 505
				Asn
				Val
				Ser
				Asp
				Gln 510
				Glu
				Glu
Val	Leu	Glu 515	Ile	Asp
				Val
				Asp
				Lys 520
				Gln
				Glu
				Thr
				Leu
				Ile 525
				Ser
				Asn
				Thr
Asn 530	Glu	Ser	Ala	Ala
				Leu
				Ala 535
				Asn
				His
				Lys
				Leu
				Gln 540
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				Asp
				Ala
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<211> 1860

<212> DNA  
<213> Bacillus and Bifidobacterium breve

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Pro Arg Ser Phe Gln Asp Thr Asn Gly Asp Gly Phe Gly Asp Leu Lys  
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Gly Ile Thr Ser Arg Leu Asp Tyr Leu Ala Asp Leu Gly Val Asp Val  
65 70 75 80  
Leu Trp Leu Ser Pro Val Tyr Arg Ser Pro Gln Asp Asp Asn Gly Tyr  
85 90 95  
Asp Ile Ser Asp Tyr Arg Asp Ile Asp Pro Leu Phe Gly Thr Leu Asp  
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Asp Met Asp Glu Leu Leu Ala Glu Ala His Lys Arg Gly Leu Lys Ile  
115 120 125  
Val Met Asp Leu Val Val Asn His Thr Ser Asp Glu His Ala Trp Phe  
130 135 140  
Glu Ala Ser Lys Asp Lys Asp Asp Pro His Ala Asp Trp Tyr Trp Trp  
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Arg Pro Ala Arg Pro Gly His Glu Pro Gly Thr Pro Gly Ala Glu Pro  
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Glu Arg Gly Glu Tyr Tyr Leu His Gln Phe Ser Lys Lys Gln Pro Asp  
195 200 205  
Leu Asn Trp Glu Asn Pro Ala Val Arg Arg Ala Val Tyr Asp Met Met  
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225 230 235 240  
Thr Leu Ile Ser Lys Arg Thr Asp Ala Asn Gly Arg Leu Pro Gly Glu  
245 250 255

Thr Gly Ser Glu Leu Gln Asp Leu Pro Val Gly Glu Glu Gly Tyr Ser  
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 Ala Glu Met Arg Arg Glu Val Phe Asp Gly Arg Asp Gly Phe Leu Thr  
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 Asp Pro Ala Asn Gly Glu Leu Asp Met Leu Phe Leu Phe Glu His Met  
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 Pro Ala Asp Leu Glu Thr Lys Leu Ala Glu Gln Gln Asp Ala Ile Ala  
 355 360 365  
 Arg His Gly Trp Ala Ser Leu Phe Leu Asp Asn His Asp Gln Pro Arg  
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 Val Val Ser Arg Trp Gly Asp Asp Thr Ser Lys Thr Gly Arg Ile Arg  
 385 390 395 400  
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 420 425 430  
 Ser Leu Asp Gln Tyr Arg Asp Leu Glu Ser Ile Asn Ala Tyr His Gln  
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 Arg Val Glu Glu Thr Gly Ile Arg Thr Ser Glu Thr Met Met Arg Ser  
 450 455 460  
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 465 470 475 480  
 Asp Ser Thr Tyr Ala Gly Phe Thr Met Pro Asp Ala Pro Val Glu Pro  
 485 490 495  
 Trp Ile Ala Val Asn Pro Asn His Thr Glu Ile Asn Ala Ala Asp Glu  
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 Ile Asp Asp Pro Asp Ser Val Tyr Ser Phe His Lys Arg Leu Ile Ala  
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530

535

540

Glu Thr Gly Asn Asp Arg Ile Ile Ala Phe Thr Arg Thr Leu Asp Glu  
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Ala Gly Glu Leu Glu Thr Met Pro Asp Gly Thr Ile Leu Ile Ala Asn  
 580 585 590

Thr Asp Asp Pro Val Gly Asn Leu Lys Thr Thr Gly Thr Leu Gly Pro  
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Trp Glu Ala Phe Ala Met Glu Thr Asp Pro Glu  
 610 615

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&lt;211&gt; 1653

&lt;212&gt; DNA

&lt;213&gt; Bacillus and Streptococcus mutans

&lt;400&gt; 42

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 <213> Bacillus and Streptococcus mutans

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 35 40 45

Ser Lys Leu Asp Tyr Leu Gln Lys Leu Gly Val Met Ala Ile Trp Leu  
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Ser Pro Val Tyr Asp Ser Pro Met Asp Asp Asn Gly Tyr Asp Ile Ala  
 65 70 75 80

Asn Tyr Glu Ala Ile Ala Asp Ile Phe Gly Asn Met Ala Asp Met Asp  
 85 90 95

Asn Leu Leu Thr Gln Ala Lys Met Arg Asp Ile Lys Ile Ile Met Asp  
 100 105 110

Leu Val Val Asn His Thr Ser Asp Glu His Thr Trp Phe Ile Glu Ala  
 115 120 125

Arg Glu His Pro Asp Ser Ser Glu Arg Asp Tyr Tyr Ile Trp Cys Asp  
 130 135 140

Gln Pro Asn Asp Leu Glu Ser Ile Phe Gly Gly Ser Ala Trp Gln Tyr  
 145 150 155 160

Asp Asp Lys Ser Asp Gln Tyr Tyr Leu His Phe Phe Ser Lys Lys Gln  
 165 170 175

Pro Asp Leu Asn Trp Glu Asn Ala Asn Leu Arg Gln Lys Ile Tyr Asp  
 Page 41



Leu Ile Gln Leu Arg Lys Glu Asn Asp Trp Leu Val Asp Ala Asp Phe  
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 485 490 495  
 Arg Glu Glu Arg Tyr Leu Ile Val Val Asn Val Ser Asp Gln Glu Glu  
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 Val Leu Glu Ile Asp Val Asp Lys Gln Glu Thr Leu Ile Ser Asn Thr  
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 530 535 540  
 Phe Cys Ile Lys Ile Asn  
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